

**REMARKS**

Reconsideration of this application is requested. Claims 8-18 and 25-31 are in the case.

**I. ELECTION/RESTRICTION**

The election of Group II, namely claims 8-18, is hereby affirmed. Claims 1-7 and 19-24 have been canceled without prejudice to the possibility of pursuing that subject matter in a separate divisional application.

**II. SPECIFICATION**

An Abstract is presented on a separate sheet attached to this response. The Abstract is based on claim 8 as amended in the present response. No new matter is entered.

**III. THE 35 U.S.C. § 112, SECOND PARAGRAPH, REJECTION**

Claims 8-18 stand rejected under 35 U.S.C. § 112, second paragraph, as allegedly indefinite for the reasons stated on pages 2 and 3 of the Action. The claims have been amended to deal with certain of these points. The following comments are offered.

Claim 8 has been rejected on the ground that the expression "the treated aqueous supersaturated solution" allegedly lacks antecedent basis. In response, "treated" has been removed from claim 8.

Claim 8 has been rejected as indefinite in that it depends on non-elected claim 1.

In response, the subject matter of claim 1 has been incorporated into claim 8.

Claim 15 has been rejected in view of the expression "which subjected". In response, that expression has been amended to read "which is subjected".

Claim 16 has been rejected on the ground that "50% w/w" is allegedly indefinite. This rejection is not understood. One of ordinary skill would readily understand that this expression means the weight of the seed crystals expressed as a percentage of the total weight of seed crystals and depositable mineral salts in the aqueous supersaturated solution. The expression "w/w" is intended to indicate this.

Reconsideration and withdrawal of this aspect of the formal rejection are accordingly respectfully requested.

In claim 17, the expression "the distribution steps" has been amended to remove "steps". This amendment overcomes the lack of antecedent basis rejection.

Claim 18 is rejected on the ground that "complimentary ion" is allegedly indefinite. In response, this expression means a reactive ion which will form an insoluble salt with the principal ion in the aqueous precursor liquid. Thus, if the aqueous precursor liquid contains barium ions, then the complimentary ion could be sulphate, for example, from sea water containing sodium sulphate.

Withdrawal of the outstanding 35 U.S.C. § 112, second paragraph, rejection is now believed to be in order. Such action is respectfully requested.

**IV. THE ANTICIPATION REJECTIONS**

Claims 8 and 16 stand rejected under 35 U.S.C. § 102(b) as allegedly anticipated by EP 0916 622 A1. Claims 8 and 9 stand rejected under 35 U.S.C. § 102(b) as allegedly anticipated by U.S. Patent 4,004,886 to Thijssen. Those rejections are respectfully traversed.

EP 0916622A discloses the use of seed crystals having an average diameter of 0.05 to 100 microns, preferably an average diameter of 5 to 50 microns. In the examples which give values, the seed crystals are 20 to 50 microns (Example 1) and 5 to 10 microns (Examples 2 and 3).

In contrast, present claim 8 (and claim 16 which is dependent on claim 8) requires a mean particle size for the seed crystals of less than 2.5 microns. This range is nowhere specifically disclosed in EP 0916622A, and the preferred size in EP 0916622A is above 5 microns (EP 0916622 in fact directs the reader away from using a size of less than 2.5 microns because of the disclosure of the Examples and the preferred range of 5 to 50 microns). A particle size range of 5 to 50 microns is very unsuitable for certain applications. For example, in the highly reactive systems employed in the petrochemical industry, the crystal size of untreated solutions are actually within the range of 5 to 50 microns and scaling is observed to occur in a very rapid manner. This scaling is only prevented (or substantially reduced) when small seed crystals with a mean particle size of less than 2.5 microns are employed..

In light of the above, it is believed that EP 0916622A does not anticipate either claim 8 or claim 16. Withdrawal of the anticipation rejection based on EP 0916622A is respectfully requested.

With reference to the anticipation rejection of claims 8 and 9, U.S. patent 4,004,886 has nothing to do with reducing the deposition of mineral salts from an aqueous supersaturated solution on to a solid surface in contact with that supersaturated solution. The process described in U.S. 4,004,886 is actually concerned with a particular crystallization process which employs a cooling/evaporation cycle and is particularly useful in the food industry for concentrating aqueous solutions of food products. U.S. patent 4,004,886 has nothing to do with scaling problems. Accordingly, there is no disclosure in U.S. patent 4,004,886 of a method of reducing deposition of mineral salts from an aqueous supersaturated solution on to a solid surface in contact with the solution, comprising the three presently claimed steps. U.S. 4,004,886 therefore does not anticipate the presently claimed method.

Furthermore, contrary to the Examiner's assertion, there is no actual disclosure in U.S. patent 4,004,886 of seed crystals having a mean particle size of less than 2.5 microns. The Examiner has pointed to the disclosure of the range of 0.1 to 10 microns at column 3, line 28. However, that passage is a general disclosure concerning kinds of crystals that are known in the field of physical chemistry. So far as the size of the crystals used in the invention of U.S. patent 4,004,886 is concerned, there is no disclosure of seed crystals of a size less than 2.5 microns. Column 4, line 19 to 21 speaks of nuclei in the precrystallization zone not being given the opportunity of growing to a dimension of more than 10 microns, and Example 1 (column 8, line 61) refers to ice nuclei of a size smaller than 5 microns. For the two stage crystallization process of U.S. patent 4,004,886, therefore, there is no specific disclosure of a crystal size of less than 2.5 microns.

The reference to super saturation in U.S. 4,004,886 patent only relates to the precrystallization zone containing the small crystal nuclei. However, there is no disclosure of the crystallization zone being supersaturated. Clearly, therefore, U.S. patent 4,004,886 does not disclose "an aqueous super saturated solution" to which a composition containing seed crystals is added.

There are further differences which establish that U.S. patent 4,004,886 does not anticipate the presently claimed invention. In the presently claimed invention, the seed crystals are employed to mop up solute which would otherwise become deposited on the solid surfaces of the equipment. This is achieved by the controlled precipitation of the mineral salts onto the seed crystals. U.S. patent 4004,886 is completely different. The crystal nuclei in the precrystallization zone are *redissolved* in the crystallization zone and then recrystallized onto the larger crystals which are already present in the crystallization zone. This is actually the **reverse** of the process occurring in the present invention. The aim of the invention of U.S. patent 4,004,886 is to provide large and uniformly-sized crystals in the crystallization zone, and these can be of the order of 1mm in diameter (see Example 2). In contrast, the chemical nature of the seed crystals used in the present invention (e.g., barium sulphate, calcium carbonate, calcium sulphate) are such that the crystals are essentially insoluble. Thus, there is no redissolution of the seed crystals in the present invention, and the growth takes place upon the seed crystals and not upon the larger particles of mineral salt in the aqueous saturated solution.

It is clear that the claimed method of the present invention is not anticipated by either of the cited references. Reconsideration and withdrawal of the outstanding anticipation rejections are accordingly respectfully requested.

**V. THE OBVIOUSNESS REJECTIONS**

Combinations of claims stand rejected under 35 U.S.C. § 103(a) as allegedly unpatentable over U.S. 4,004,886 in combination with various secondary references. Those rejections are respectfully traversed.

U.S. Patent 4,004,886 does not anticipate the methodology as claimed for the above-discussed reasons. As will be clear from the following discussion, the presently claimed methodology is also not rendered obvious by the '886 patent.

There are distinct advantages associated with the use of very small seed crystals with a mean particle size of less than 2.5 microns, as explained on pages 4 and 5 of the specification. An important aspect of the present invention is the production, by the use of physical disturbance (such as ultrasound, although other means can be used), of a population of very small seed crystals (having dimensions less than 2.5 microns). New claim 31 is directed to this feature. The seed crystals produced by use of physical disturbance (such as ultrasound) are relatively uniform in size distribution as compared to seed crystals produced by other methods. In many instances, the seed crystals also have an internal cavity. Therefore, for any given weight of crystals, this population of seed crystals, because of the large surface area, is more effective at removing scale-forming components from process water than a population of larger crystals. The effective surface area of the crystals is also increased by the presence of internal

cavities. In addition, the amount of scale-forming components which can be absorbed by a population of small crystals, before a critical crystal size is attained, is also greater than can be achieved by a population of larger crystals.

It is believed, therefore, that the person of ordinary skill, when faced with the problem of scaling addressed by the present invention, would not resort to the disclosure of U.S. patent 4,004,886. U.S. patent 4,004,886 is concerned with a completely different problem. Small crystal nuclei are employed in U.S. 4,004,886 in order to give an increase in the average size of the product crystals in the crystallization zone (see column 4, lines 52 to 56). They are not used in order to address the problem of scale formation from supersaturated solutions, and there is nothing in U.S. 4,004,886 that would suggest to the person of ordinary skill that the use of a seed crystal of mean particle size of less than 2.5 microns might be of assistance in addressing the problem of scale formation in supersaturated solutions.

In light of the above, one of ordinary skill in the art would not have been motivated to arrive at the presently claimed invention based on the combinations of references relied upon in the Action. Absent any such motivation, it is clear that a *prima facie* case of obviousness is not generated in this case against any of the pending claims. Reconsideration and withdrawal of the outstanding obviousness rejections are accordingly respectfully requested.

## VI. NEW CLAIMS

New claims 25-31 are presented. These are based on the subject matter of claims 2-7, and the disclosure at page 6 line 13, and do not introduce new subject

matter. Entry and favorable consideration of those claims together with the amended claims are respectfully requested.

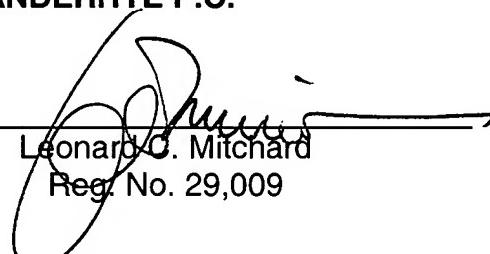
**VII. SPECIFICATION**

Customary headings have been introduced into the specification, including a brief description of the drawings. No new matter is entered.

Allowance of the application is awaited.

Respectfully submitted,

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